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EXAMINER	
PASIA, REDENTOR M	

ART UNIT	PAPER NUMBER
2616	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/718,837	RAGHOTHAMAN ET AL.
	Examiner	**Art Unit**
	REDENTOR M. PASIA	2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _13 June 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-4,6-11 and 14-28_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-4,6-11 and 14-28_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _21 November 2003_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on June 13, 2008 has been entered. Claims 1, 11, 21-22 have been amended. Claims 5, 12-13 are canceled. Claims 1-4, 6-11 and 14-28 are still pending in this application, with claims 1, 11, 21, and 22 being independent.

Claim Objections

2. Claim 11 is objected to because of the following informalities: page 4, line 5 shows the claim limitation, "a first eigenvector block..." It is suggested by the Examiner that the paragraph introducing the above-mentioned claim limitation should include an indent in order to properly separate the paragraph that includes the above-mentioned claim limitation and easily inform the reader that a new paragraph has started.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were

made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-4, 6-7, 9-11, 14-16, 18-23, and 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856; hereinafter Ketchum) in view of Dabak et al. (US 6,594,473; hereinafter Dabak).

As to claim 1, Ketchum shows a method (abstract) comprising:

encoding (Figure 4a, 4b, encoder 412) a plurality of N systematic bit (Figure 4a, 4b, information bits) across time (Par. 0099, the base code maybe a turbo code, convolutional code) into an encoded packet of size M bits (Figure 4a, 4b, modulation symbols);

determining a quality of at least a first channel from a feedback circuit (Figure 3,4b, full/partial channel state information CSI; it is noted that channel state information (CSI) descriptive of the link conditions may be determined and provided to the transmitter system);

dividing (Figure 4a, 4b, demultiplexer 424; page 9, equation 27) the encoded packet into a first transmission packet defining a first size M1 bits that includes N1 of the N systematic bits and a second transmission packet defining a second size M2 bits that includes N2 of the N systematic bits (Figure 4A-C; Par. 0114-0115 shows that the information bits to be transmitted are demultiplexed by a demultiplexer 428 into a

number of (up to N_L) frequency subchannel data streams, one stream for each of the frequency subchannels to be used for the data transmission. Table 1, shows the # of Information bits/symbol (N) with their respective # of coded bits/symbol (modulation symbols); It is noted that in figure 4, it is shown that information bits are input into the TX data processor to provide weighted modulation symbols. Table 1 shows the # of Information Bits/Symbol along with the # of Coded Bits/Symbol with their designated modulation symbols and SNR),

wherein at least one of M1 and N1 is based on the determined quality of the first channel (Figure 3, 4B, shows the CSI link; Table 1, shows a column indicating the received SNR; Equation 27; Par. 0107 that the transmitter is capable of preconditioning the weighted modulation symbols based on the full CSI) and

transmitting in parallel (Par. 0124; multiple parallel transmission channels supported by MIMO) the first transmission packet from a first antenna over the first channel (Figure 3, 4a-c, antenna 324a-t) and the second transmission packet from a second antenna (Figure 3, 4a-c, antenna 324a-t) over a second channel (Par. 0107-0111, shows Equation 27 that shows the weighted modulation symbols with their respective sub-channels),

wherein M, M1, M2, N, N1 and N2 are all non-zero integers (Table 1; M, M1, M2 are the # of coded bits/symbols (modulation symbols) for a particular SNR range and N, N1, N2 are the # of information bits and symbols for the same particular SNR range; Equation 27; Par. 0106-0112) except one of N1 and N2 may be zero (The examiner interprets this claim limitation as having only either N1 or N2 present which suggests that only one antenna is in use for transmission. In a case, where N1 or N2 is either zero, it

suggests that the demultiplexer only outputs one subpacket (same as the packet) and the packet is transmitted onto only one of the antennas. Par. 0104, shows that the demultiplexer demultiplexes the received modulation symbols into a number of (N_T) modulation symbol streams, one stream for each antenna used to transmit the modulation symbols.), M is greater than N (Table 1 shows that at a particular SNR range, the #of coded bits/symbol (claimed M) is greater than #of information bits/symbol (claimed N)), M is at least equal to M1+M2, and N is at least equal to N1+N2 (Par. 0104-0112; it is noted that modulation symbols are "demultiplexed" into modulation symbol streams, one stream for each antenna used; Table 1 shows that the information bits are modulated into coded bits. Hence, coded bits (modulation symbol stream) contain the information bits within.).

It should be noted that the system of Ketchum provides a symbol weighting element the weighs the modulation symbols for each selected channel based on a respective weight selected for that channel to provide weighted modulation symbols (Par. 0096). The pre-weighting for each transmission channel is based on the channel's CSI (Par. 0028). The CSI includes sufficient information in whatever form that may be used to (1) select a set of transmission channels that will result in optimum or near optimum throughput, (2) determine a weighting factor for each selected transmission channel that results in equal or near equal received SNRs, and (3) infer an optimum or near optimum code rate for each selected transmission channel (Par. 0160). Furthermore, Ketchum also shows the steps of weighting the symbols prior to transmission (refer to Figures). The weights applied to the symbols also determine the rate at which the transmission is held.

However, Ketchum does not specifically show different weights being applied to the symbols, therefore, transmission at different rates is not shown.

Even though, Ketchum shows the above-features, Ketchum does not explicitly show (transmission) at a first rate at a first power modified by a first weight value and (transmission) at a second rate that differs from the first rate and at the first power modified by a second weight value.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Dabak. Dabak shows a closed-loop MIMO transmitter (Figure 4) that also utilizes a Channel Estimator (Figure 4). Dabak shows transmission at a first rate at a first power modified by a first weight value (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is also noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights $\mathbf{W_1}$ (claimed first weight) and W_2. Thereupon, these weights ($\mathbf{W_1}$ applied to first channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.) and transmission at a second rate that differs from the first rate and at the first power modified by a second weight value (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate

since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights W_1 and $\mathbf{W_2}$ (claimed second weight). Thereupon, these weights ($\mathbf{W_2}$ applied to second channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.).

In view of the above, having the system of Ketchum and then given the well-established teaching of Dabak, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Ketchum, as taught by Dabak in order to achieve better performance with a lesser amount of complexity than is required in the prior art (col. 12, lines 40-53).

As to claim 2, modified Ketchum shows that the dividing the encoded packet comprises maximizing a number N1 of systematic bits in the first transmission packet (Ketchum: Par. 0106, 0104; Table 1; shows that the demultiplexer demultiplexes the received modulation symbols into a number (N_T) of modulation symbol streams, one stream for each antenna used. In a case, where only one antenna is used, the modulation symbol stream contains all of the initial information bits where it is maximized into one stream.).

As to claim 3, modified Ketchum shows that N=N1 and N2=0 (Ketchum: Par. 0106, 0104; Table 1; shows that the demultiplexer demultiplexes the received modulation symbols into a number (N_T) of modulation symbol streams, one stream for each antenna used. In a case, where only one antenna is used, the modulation symbol stream contains all of the initial information bits where it is maximized into one stream.).

As to claim 4, modified Ketchum shows that M1=M2 and N1≠N2 (Ketchum: Par. 0103-0104, Table 1; shows the relationship between information bits and coded bits (modulation symbol stream). In a case where SNR range > 17.35, the information bits (N) per symbol is 5 and # of coded bits (M) per symbol is 6, once the modulation symbols are demultiplexed into a number of (N_T) modulation symbol streams, one stream for each for each antenna (i.e. 2 antennas) used, M and N (N is encoded in M as discussed above) are divided into two streams. $M_1 = M_2 = 6/2$, and $N_1 = 3$, $N_2 = 2$ (thus, $N_1 \neq N_2$) or the other way around.).

As to claim 6, modified Ketchum shows the step of transmitting the second transmission packet from the second antenna over the second channel at a second power modified by a third weight value, and from the first antenna over the first channel at the second power modified by a fourth weight value (Ketchum: Par. 0106-0113, shows equation 27, that comprises of 3 matrices, one matrix shows b1...b_{NC} which are the weighted modulation symbols for spatial subchannels 1,2,...N_{NC}, second matrix shows e_{ij} which are the elements of eigenvector matrix E related to the transmission characteristics and are also take into account in determining effective channel gains H(j,k) and third matrix, x1...x_{NT} which shows the precondition modulation symbols; Par. 0111, shows the multiple preconditioned modulation symbols, transmitted on the channels available and modified by the eigenvector elements).

As to claim 7, modified Ketchum shows the step of interleaving over the M bits (Ketchum: Figure 4a-b, channel interleaver 414).

As to claim 9, modified Ketchum shows that the determining a quality of at least a first channel comprises determining a capacity of said first channel (Ketchum: Figure 3, 4b, CSI; Par. 0026; to more fully utilize the capacity of the transmission channels, channel state information (CSI) descriptive of the link conditions may be determined (typically at the receiver system) and provided to the transmitter system.).

As to claim 10, modified Ketchum shows that the step of determining a quality of at least a first channel comprises determining a quality of a second channel (Ketchum: Par. 0026, partial CSI, may include the SNRs of the transmission channels), and the values of M1 and M2 are determined from the quality of the first and second channels (Ketchum: Par. 0096 shows that symbol weighting weighs the modulation symbols based on respective weight selected for the channel to provide weighted modulation. It is noted that the CSI provides the feedback information necessary to assign proper weights. Table 1, shows the relationship between SNRs and modulated symbols. Dabak: Figure 4 and 8; col. 9, line 30 to col. 10, line 13).

As to claim 11, Ketchum shows a device (Figures 3, 4a-b; transmitter 310) comprising:

an encoder (Figures 4a-b, encoder 412) having an input for receiving a plurality of N systematic bits (Figure 4a-b, information bits) and an output for outputting a plurality of M bits (Figure 4a-b, modulation symbols), wherein M is greater than N (Table 1, shows the # of Information bits/symbol (N) with their respective # of coded bits/symbol (modulation symbols); It is noted that in figure 4, it is shown that information bits are input into the TX data processor to provide weighted modulation symbols. Table 1

shows the # of Information Bits/Symbol along with the # of Coded Bits/Symbol with their designated modulation symbols and SNR);

a channel feedback circuit (Figures 3, 4b, channel state information (CSI) feedback) for determining a channel characteristic of a first communication channel;

a demultiplexer (Figure 4a-b, demultiplexer 424, Par. 0104; a demultiplexer 424 receives and demultiplexes the weighted modulation symbol into a number of modulation symbol streams, one stream for each transmission channel selected to transmit the modulation symbols.) having an input coupled to an output of the encoder and an input coupled to an output of the channel feedback circuit (Figure 4b), said demultiplexer for outputting in parallel a first portion M1 of the M bits at a first output and a second portion M2 of the M bits at a second output (Figure 4A-C; Par. 0114-0115 shows that the information bits to be transmitted are demultiplexed by a demultiplexer 428 into a number of (up to N_L) frequency subchannel data streams, one stream for each of the frequency subchannels to be used for the data transmission. Table 1, shows the # of Information bits/symbol (N) with their respective # of coded bits/symbol (modulation symbols); It is noted that in figure 4, it is shown that information bits are input into the TX data processor to provide weighted modulation symbols. Table 1 shows the # of Information Bits/Symbol along with the # of Coded Bits/Symbol with their designated modulation symbols and SNR);

a first amplifier (Figure 4a-b, modulator 322a-t) coupled to said first output for increasing a power of said first portion M1 of the M bits (Par. 0104; each modulator further amplifies a modulation symbol);

a first antenna (Figure 4a-b, 324a-t) coupled to the first output for transmitting said first portion M1 of the M bits (Par. 0092, transmitted via respective antenna 324); and

a second amplifier (Figure 4a-b, modulator 322a-t) coupled to said second output for increasing a power of said second portion M2 of the M bits (Par. 0104; each modulator further amplifies a modulation symbol);

a second antenna (Figure 4a-b, 324a-t) coupled to the second output for transmitting said second portion M2 of the M bits (Par. 0092, transmitted via respective antenna 324); and

a first eigenvector block in series with the first output, said first eigenvector block coupled to said first and said second antenna for applying a first power weight factor (Par. 0110, e_{ij} are elements of eigenvector matrix E) to said first portion M1 of the M bits prior to transmission from said first antenna and for applying a second power weight factor to said first portion M1 of the M bits prior to transmission from said second antenna (Par. 0106-0113, shows equation 27, that comprises of 3 matrices, one matrix shows $b1...b_{NC}$ which are the weighted modulation symbols for spatial subchannels $1,2,...N_{NC}$, second matrix shows e_{ij} which are the elements of eigenvector matrix E related to the transmission characteristics and are also take into account in determining effective channel gains H(j,k) and third matrix, $x1...x_{NT}$ which shows the precondition modulation symbols; Par. 0111, shows the multiple preconditioned modulation symbols, transmitted on the channels available and modified by the eigenvector elements).

It should be noted that the system of Ketchum provides a symbol weighting element the weighs the modulation symbols for each selected channel based on a

respective weight selected for that channel to provide weighted modulation symbols (Par. 0096). The pre-weighting for each transmission channel is based on the channel's CSI (Par. 0028). The CSI includes sufficient information in whatever form that may be used to (1) select a set of transmission channels that will result in optimum or near optimum throughput, (2) determine a weighting factor for each selected transmission channel that results in equal or near equal received SNRs, and (3) infer an optimum or near optimum code rate for each selected transmission channel (Par. 0160). Furthermore, Ketchum also shows the steps of weighting the symbols prior to transmission (refer to Figures). The weights applied to the symbols also determine the rate at which the transmission is held. However, Ketchum does not specifically show different weights being applied to the symbols, therefore, transmission at different rates is not shown.

Even though, Ketchum shows the above-features, Ketchum does not explicitly show (transmission) at a first rate (transmission) at a second rate that differs from the first rate.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Dabak. Dabak shows a closed-loop MIMO transmitter (Figure 4) that also utilizes a Channel Estimator (Figure 4). Dabak shows transmission at a first rate (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is also noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights

$\mathbf{W_1}$ (claimed first weight) and W_2. Thereupon, these weights ($\mathbf{W_1}$ applied to first channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.) and transmission at a second rate that differs from the first rate (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights W_1 and $\mathbf{W_2}$ (claimed second weight). Thereupon, these weights ($\mathbf{W_2}$ applied to second channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.).

In view of the above, having the system of Ketchum and then given the well-established teaching of Dabak, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Ketchum, as taught by Dabak in order to achieve better performance with a lesser amount of complexity than is required in the prior art (col. 12, lines 40-53).

As to claim 14, modified Ketchum shows that said first and second power weight factor are based on a channel quality of a first and second channel provided by said channel feedback circuit (Ketchum: Par. 0106-0113, shows equation 27; e_{ij} are elements of an eigenvector matrix E related to the transmission characteristics from the transmit

antennas to the receive antennas) said first antenna transmitting over said first channel and said second antenna transmitting over said second channel (Figure 3).

As to claim 15, modified Ketchum shows a second eigenvector block in series with the second output, said second eigenvector block coupled to said first and said second antenna for applying a third weight factor to said second portion M2 of the M bits prior to transmission from said second antenna and for applying a fourth power weight factor to said second portion M2 of the M bits prior to transmission from said first antenna (Par. 0106-0113, shows equation 27, that comprises of 3 matrices, one matrix shows $b1...b_{NC}$ which are the weighted modulation symbols for spatial subchannels $1,2,...N_{NC}$, second matrix shows e_{ij} which are the elements of eigenvector matrix E related to the transmission characteristics and are also take into account in determining effective channel gains H(j,k) and third matrix, $x1...x_{NT}$ which shows the precondition modulation symbols; Par. 0111, shows the multiple preconditioned modulation symbols, transmitted on the channels available and modified by the eigenvector elements).

As to claim 16, modified Ketchum shows that said third and fourth power weight factors are based on a channel quality of a first and second channel provided by said channel feedback circuit (Ketchum: Par. 0106-0113, shows equation 27; e_{ij} are elements of an eigenvector matrix E related to the transmission characteristics from the transmit antennas to the receive antennas), said first antenna transmitting over said first channel and said second antenna transmitting over said second channel (Figure 3).

As to claim 18, modified Ketchum shows that the first M1 and second M2 portion are the same size and the systematic bits are not equally distributed among the first Mi and second M2 portion (modified: Par. 0103-0104, Table 1; shows the relationship

between information bits and coded bits (modulation symbol stream). In a case where SNR range > 17.35, the information bits (N) per symbol is 5 and # of coded bits (M) per symbol is 6, once the modulation symbols are demultiplexed into a number of (N_T) modulation symbol streams, one stream for each for each antenna (i.e. 2 antennas) used, M and N (N is encoded in M as discussed above) are divided into two streams. $M_1 = M_2 = 6/2$, and $N_1 = 3$, $N_2 = 2$ (thus, $N_1 \neq N_2$) or the other way around.).

As to claim 19, this claim is rejected using the same reasoning set forth in the rejection of claim 2.

As to claim 20, modified Ketchum shows a first subpacket selector (Ketchum: Figure 3, controller 334) having an input coupled to the first output of the demultiplexer, an input coupled to an output of the feedback circuit, and an output coupled to the first antenna (Ketchum: Figure 4a-b in relation to Figure 3), said first subpacket selector for selecting and combining, into a first transmission packet that is transmitted over the first channel, the first portion M1 and at least one additional subpacket from the first output of the demultiplexer, wherein a size of said first transmission packet is determined at least in part based on the output of channel feedback circuit 21 (Ketchum: Figure 3, 4a-b; Par. 0171-0173; recovers the reported CSI, which is then provided to controller 334; Controller 334 uses the reported CSI to perform a number of functions including (1) selecting the set of N_S best available transmission channels for data transmission, (2) determining the coding and modulation scheme to be used for data transmission on the selected transmission channels, and (3) determining the weights to be used for the selected transmission channels. Controller 334 may select the transmission channels to

achieve high throughput or based on some other performance criteria or metrics, and may further determine the threshold used to select the transmission channels).

As to claim 21, Ketchum shows a method (abstract) comprising:

encoding (Figure 4a, 4b, encoder 412) a plurality of input bits (Figure 4a, 4b, information bits);

based on a determined characteristic of at least a first channel (Figure 3,4b, ful/partial channel state information CSI), adaptively splitting the encoded input bits into a first subpacket defining a first subpacket size and a second subpacket defining a second subpacket size (Figure 4a, 4b, demultiplexer 424; page 9, equation 27; Par. 0104, 0106-0115 shows that the information bits to be transmitted are demultiplexed by a demultiplexer 428 into a number of (up to N_L) frequency subchannel data streams, one stream for each of the frequency subchannels to be used for the data transmission.);

and transmitting the first subpacket over the first channel and the second subpacket over a second channel (Par. 0107-0111, shows Equation 27 that shows the weighted modulation symbols with their respective sub-channels).

It should be noted that the system of Ketchum provides a symbol weighting element the weighs the modulation symbols for each selected channel based on a respective weight selected for that channel to provide weighted modulation symbols (Par. 0096). The pre-weighting for each transmission channel is based on the channel's CSI (Par. 0028). The CSI includes sufficient information in whatever form that may be used to (1) select a set of transmission channels that will result in optimum or near optimum throughput, (2) determine a weighting factor for each selected transmission channel that results in equal or near equal received SNRs, and (3) infer an optimum or near optimum

code rate for each selected transmission channel (Par. 0160). Furthermore, Ketchum also shows the steps of weighting the symbols prior to transmission (refer to Figures). The weights applied to the symbols also determine the rate at which the transmission is held. However, Ketchum does not specifically show different weights being applied to the symbols, therefore, transmission at different rates is not shown.

Even though, Ketchum shows the above-features, Ketchum does not explicitly show (transmission) at a first rate at a first power modified by a first weight value and (transmission) at a second rate that differs from the first rate and at the first power modified by a second weight value.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Dabak. Dabak shows a closed-loop MIMO transmitter (Figure 4) that also utilizes a Channel Estimator (Figure 4). Dabak shows transmission at a first rate at a first power modified by a first weight value (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights $\mathbf{W_1}$ (claimed first weight) and W_2. Thereupon, these weights ($\mathbf{W_1}$ applied to first channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.) and transmission at a second rate that differs from the first rate and at the first power modified by a second weight value (Figure 4 and 8; col. 9, line 30 to col.

10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights W_1 and $\mathbf{W}_2$ (claimed second weight). Thereupon, these weights ($\mathbf{W}_2$ applied to second channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.).

In view of the above, having the system of Ketchum and then given the well-established teaching of Dabak, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Ketchum, as taught by Dabak in order to achieve better performance with a lesser amount of complexity than is required in the prior art (col. 12, lines 40-53).

As to claim 22, Ketchum shows an apparatus (Figure 3, 4a-b, transmitter 310) comprising:

an encoder (Figures 4a-b, encoder 412) to encode a plurality of input bits (figure 4a-b, information bits);

a demultiplexer (Figure 4a-b, demultiplexer 424), having an input coupled to an output of the encoder, to adaptively split the encoded plurality of bits into a first subpacket defining a first subpacket size and a second subpacket defining a second subpacket size (Figure 4a, 4b, demultiplexer 424; page 9, equation 27; Par. 0104, 0106-0115 shows that the information bits to be transmitted are demultiplexed by a

demultiplexer 428 into a number of (up to N_L) frequency subchannel data streams, one stream for each of the frequency subchannels to be used for the data transmission.);

a first antenna (Figure 4a-b, 324a-t) coupled to an output of the demultiplexer, to transmit the first subpacket (Par. 0092, transmitted via respective antenna 324) over a first channel (Par. 0107-0111, shows Equation 27 that shows the weighted modulation symbols with their respective sub-channels); and

a second antenna (Figure 4a-b, 324a-t) coupled to an output of the demultiplexer, to transmit the second subpacket (Par. 0092, transmitted via respective antenna 324) over a second channel (Par. 0107-0111, shows Equation 27 that shows the weighted modulation symbols with their respective sub-channels).

It should be noted that the system of Ketchum provides a symbol weighting element the weighs the modulation symbols for each selected channel based on a respective weight selected for that channel to provide weighted modulation symbols (Par. 0096). The pre-weighting for each transmission channel is based on the channel's CSI (Par. 0028). The CSI includes sufficient information in whatever form that may be used to (1) select a set of transmission channels that will result in optimum or near optimum throughput, (2) determine a weighting factor for each selected transmission channel that results in equal or near equal received SNRs, and (3) infer an optimum or near optimum code rate for each selected transmission channel (Par. 0160). Furthermore, Ketchum also shows the steps of weighting the symbols prior to transmission (refer to Figures). The weights applied to the symbols also determine the rate at which the transmission is held. However, Ketchum does not specifically show different weights being applied to the symbols, therefore, transmission at different rates is not shown.

Even though, Ketchum shows the above-features, Ketchum does not explicitly show (transmission) at a first rate at a first power modified by a first weight value and (transmission) at a second rate that differs from the first rate and at the first power modified by a second weight value.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Dabak. Dabak shows a closed-loop MIMO transmitter (Figure 4) that also utilizes a Channel Estimator (Figure 4). Dabak shows transmission at a first rate at a first power modified by a first weight value (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as feedback values. These feedback values are shown in FIG. 4 as weights $\mathbf{W_1}$ (claimed first weight) and W_2. Thereupon, these weights ($\mathbf{W_1}$ applied to first channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.) and transmission at a second rate that differs from the first rate and at the first power modified by a second weight value (Figure 4 and 8; col. 9, line 30 to col. 10, line 13; it is noted that shows that the MIMO transmitter transmits multiple symbols over different channels at a given (or previous) weight. It is noted that the initial (or previous) transmission is performed at a first rate since an initial (or previous/unmodified) weight is applied. The channel estimator 50 determines estimated channel impulse responses based on the incoming de-spread data which are sent as

feedback values. These feedback values are shown in FIG. 4 as weights W_1 and $\mathbf{W_2}$ (claimed second weight). Thereupon, these weights ($\mathbf{W_2}$ applied to second channel) are applied to their respective channels. It is noted the since different weights (i.e. W1 and W2) are applied, the transmissions are held at different rates.).

In view of the above, having the system of Ketchum and then given the well-established teaching of Dabak, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Ketchum, as taught by Dabak in order to achieve better performance with a lesser amount of complexity than is required in the prior art (col. 12, lines 40-53).

As to claim 23, modified Ketchum shows a channel feedback circuit, having an output coupled to an input of the demultiplexer (Ketchum: Figure 3, 4a-b, CSI feedback), to provide a channel characteristic of at least the first channel by which the demultiplexer adaptively splits the encoded plurality of bits (Ketchum: Par. 0026; to more fully utilize the capacity of the transmission channels, channel state information (CSI) descriptive of the link conditions may be determined (typically at the receiver system) and provided to the transmitter system; Figure 4A-C; Par. 0114-0115 shows that the information bits to be transmitted are demultiplexed by a demultiplexer 428 into a number of (up to N_L) frequency subchannel data streams, one stream for each of the frequency subchannels to be used for the data transmission. Table 1, shows the # of Information bits/symbol (N) with their respective # of coded bits/symbol (modulation symbols); It is noted that in figure 4, it is shown that information bits are input into the TX data processor to provide weighted modulation symbols. Table 1 shows the # of Information Bits/Symbol along with the # of Coded Bits/Symbol with their designated modulation symbols and SNR).

As to claim 25, modified Ketchum shows the step of channel interleaving the encoded packet of size M bits with other encoded packets (Ketchum: Figure 4a-b; channel interleaver 414); and wherein dividing the encoded packet is after the channel interleaving (Ketchum: Figure 4a-b, demux 424 is after channel interleaver 414).

As to claim 26, modified Ketchum shows a channel interleaver disposed between the encoder and the demultiplexer and adapted to channel interleave the encoded packet of size M bits with other encoded packets (Ketchum: Figure 4a-b shows the position of the different parts.).

As to claim 27 and 28, these claims are rejected using the same reasoning set forth in the rejection of claims 25 and 26, respectively.

6. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Dabak et al. (US 6,594,473; hereinafter Dabak) in further view of Salvi et al. (US 2004/0139383 A1; hereinafter Salvi).

As to claim 8, modified Ketchum shows the step of interleaving over the M bits (Figure 4a-b).

Modified Ketchum does not specifically show that the encoding further comprises turbo encoding using a single turbo interleaver of size N.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Salvi. Salvi shows turbo encoding using a single turbo interleaver (Figure 2, interleaver) of size N (Table 1, Par. 0048; Par. 0040-0043).

In view of the above, having the system of modified Ketchum and then given the well-established teaching of Salvi, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of modified Ketchum as taught by Salvi in order to shorten delays in coding data (Par. 0010).

As to claim 17, Ketchum shows the transmitter further comprising a channel interleaver of length M having an input coupled to the output of the encoder (Figure 4a-b).

Modified Ketchum does not specifically show said encoder comprises an interleaver of length N.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Salvi. Salvi shows said encoder comprises an interleaver of length N (Figure 2, interleaver) of size N (Table 1, Par. 0048; Par. 0040-0043).

In view of the above, having the system of modified Ketchum and then given the well-established teaching of Salvi, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of modified Ketchum as taught by Salvi in order to shorten delays in coding data (Par. 0010).

7. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Dabak et al. (US 6,594,473; hereinafter Dabak) in further view of Kim et al. (US 2003/0128769 A1; hereinafter Kim).

As to claim 24, Ketchum shows all of the elements except wherein the at least one additional subpacket comprises only parity bits.

However, the above-mentioned claim limitation is well-established in the art as evidenced by Kim. Kim shows that the at least one additional subpacket comprises only parity bits (Par. 0076; the distribution block 66 distributes only the interleaved parity bits to a transmission antenna with a poor transmission condition.).

In view of the above, having the system of modified Ketchum and then given the well-established teaching of Kim, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of modified Ketchum as taught by Kim in order to improve system performance by assigning (or mapping) the systematic bits to the bits corresponding to positions more resistive to an error among the bits constituting a symbol and assigning the parity bits to the bits corresponding to positions relatively susceptible to an error, during modulation (Par. 0017).

Response to Arguments

8. Applicant's arguments with respect to claims 1-4, 6-11, 14-28 have been considered but are moot in view of the new ground(s) of rejection. The Applicant's Attorney bases the arguments based on the newly-added claim limitations to the independent claims. Dabak reference is introduced in order to cure the deficiency of Ketchum and show the newly-added claim limitation. The claims are rejected as follows:

- Claims 1-4, 6-7, 9-11, 14-16, 18-23, 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856; hereinafter Ketchum) in view of Dabak et al. (US 6,594,473; hereinafter Dabak).
- Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Dabak et

al. (US 6,594,473; hereinafter Dabak) in further view of Salvi et al. (US 2004/0139383 A1; hereinafter Salvi).

- Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ketchum et al. (US 2003/0048856 A1; hereinafter Ketchum) in view of Dabak et al. (US 6,594,473; hereinafter Dabak) in further view of Kim et al. (US 2003/0128769 A1; hereinafter Kim).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to REDENTOR M. PASIA whose telephone number is (571)272-9745. The examiner can normally be reached on M-F 7:30am to 4:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Aung Moe can be reached on (571)272-7314. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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